1996 A/C-HEATER SYSTEM

Automatic A/C-Heater Systems - Roadmaster

A/C SYSTEM SPECIFICATIONS

WARNING: To avoid injury from accidental air bag deployment, read and carefully follow all SERVICE PRECAUTIONS and DISABLING & ACTIVATING AIR BAG SYSTEM procedures in the article, AIR BAG RESTRAINT SYSTEM, in the ACCESSORIES/SAFETY EQUIPMENT section

CAUTION: When battery is disconnected, radio will go into anti-theft protection mode. Obtain radio anti-theft protection code from owner prior to servicing vehicle.

A/C SYSTEM SPECIFICATIONS

Application	Specification
Compressor Type	Harrison HD6/HT6 6-Cyl.
Compressor Belt Tension	(1)
System Oil Capacity	(2) 8 ozs.
Refrigerant (R-134a) Capacity	28 ozs.
System Operating Pressures (3)	
High Side	315 psi (22.1 kg/cm^2)
Low Side	36 psi (2.5 kg/cm^2)

(1) Replace belt if tensioner is not within specification and indicator marks on tensioner align. Replace belt if marks do not align.

(2) Use PAG Refrigerant Oil (Part No. 12345923).

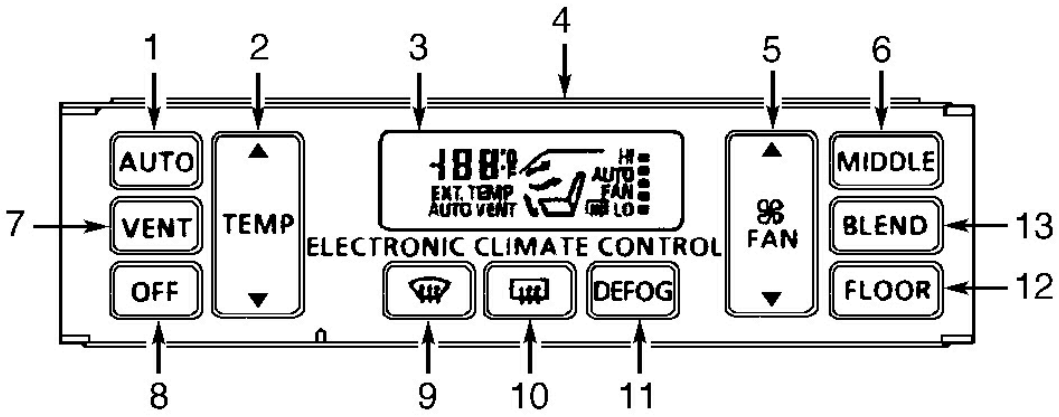
(3) With ambient temperature at 80°F (27°C) and relative humidity at 60 percent.

DESCRIPTION

All air conditioning and heating functions are controlled automatically by a microprocessor control unit located within the A/C-heater control panel. This control unit receives engine coolant temperature, vehicle speed, engine RPM, A/C clutch status and Powertrain Control Module (PCM) Diagnostic Trouble Codes (DTCs) from the PCM.

The PCM receives diagnostic mode and A/C requests for processing from the control unit. Manual controls allow the driver to select air distribution mode and desired temperature.

The automatic A/C-heater system consists of A/C-heater control panel, blower motor control module, A/C-heater evaporator module, various motors and sensors, and refrigeration system. The system includes self-diagnostic capabilities.



1. AUTO Switch
2. TEMP Switch
3. Graphic Display
4. A/C Heater Control Panel
5. Blower Speed Switch
6. MIDDLE Switch
7. VENT Switch
8. OFF Switch
9. Defrost Switch
10. Rear Window Defogger Switch
11. DEFOG Switch
12. FLOOR Switch
13. BLEND Switch

94A37309

Fig. 1: Identifying A/C-Heater Control Panel
Courtesy of GENERAL MOTORS CORP.

OPERATION

A/C-HEATER CONTROL PANEL

The A/C-heater control panel is programmed to provide a specific air outlet mode and blower motor speed for each temperature selected by operator. The system can be put into automatic operation by pressing AUTO switch. After selecting desired temperature, the entire system will operate automatically to maintain desired temperature.A/C-heater control panel will also display Diagnostic Trouble Codes (DTCs).

A/C COMPRESSOR CLUTCH OPERATION

The A/C-heater control panel will request A/C compressor clutch operation for all modes when AUTO, DEFOG or DEFROST buttons are selected. A/C-heater control panel will request A/C compressor clutch operation when ambient temperature is greater than 35°F (2°C).

If ambient temperature is less than 35°F (2°C), A/C-heater control panel will not request compressor clutch operation until ambient temperature is more than 40°F (4°C). When system is in OFF or VENT mode, A/C-heater will not request compressor clutch operation.

When power steering pressure switch senses a load of about 700 psi (49 kg/cm^2), it signals the PCM, which will de-energize A/C compressor clutch relay. This will usually occur during a parking maneuver.

ACTUATORS

Vacuum switching is controlled through a solenoid module. The solenoids are activated by the A/C-heater control panel. Upon solenoid activation, vacuum is directed to appropriate actuator. A/C-heater control panel switches polarity of air mix door motor for mode selection. Temperature valve position is monitored through input from feedback circuit in air mix door motor.

AMBIENT TEMPERATURE SENSOR

Ambient (outside) temperature sensor is a thermistor located on radiator center support, just below hood latch. As temperature decreases, resistance increases or vice versa. Resistance of sensor varies from 100,701 ohms at -40°F (-40°C) to 667 ohms at 140°F (60°C). A/C-heater control panel supplies a 5 volt reference voltage to thermistor and measures the voltage drop to determine ambient temperature. A/C-heater control panel uses ambient temperature sensor signal to control amount of cooling or heating required to maintain selected temperature.

BLOWER MOTOR CONTROL MODULE

Blower motor control module is located at the bottom of evaporator module, left of blower motor. Blower motor control module receives signals from A/C-heater control panel which are amplified into strong output signals. Blower motor module is transistorized and provides variable blower motor speeds.

In manual mode 2 blower speeds are provided. In automatic mode, 3 blower motor speeds are provided. A feedback circuit is provided to confirm blower motor speed. When heating is required, blower motor operation is delayed until engine coolant reaches adequate temperature to provide heat. Blower motor operation will not be delayed during defrost operation or with manual blower motor speed control.

INSIDE TEMPERATURE SENSOR

Inside temperature sensor is a thermistor located on top of instrument panel above glove box. Temperature sensor fits inside a short horizontal tube connected to an aspirator on the evaporator module. Inside air is drawn over thermistor providing a constantly updated inside air temperature signal to A/C-heater control panel.

As temperature decreases, resistance increases or vice versa. Resistance of sensor varies from 100,701 ohms at -40°F (-40°C) to 282 ohms at 185°F (85°C). A/C-heater control panel supplies a 5 volt reference voltage to thermistor and measures the voltage drop to determine inside temperature. A/C-heater control panel uses inside temperature signal to determine changes in mode, blower motor speed, or temperature air valve position.

SUNLOAD SENSOR

Sunload sensor is located in left side of instrument panel defroster grille. Sensor is a reverse bias photo-diode which responds to sunlight by changing resistance. A/C-heater control panel supplies a 5 volt reference voltage to sunload sensor. The effect of the sensor in bright sunlight is like decreasing temperature setting 3 degrees.

ADJUSTMENTS

TEMPERATURE AIR VALVE (A/C-HEATER CONTROL PANEL) RECALIBRATION

If a new temperature air valve (air mix door motor) is installed or A/C-heater control panel has been disconnected, A/C-heater control panel must be recalibrated. To recalibrate unit, remove instrument panel fuse block fuse No. 33. Reinstall fuse and turn ignition switch to RUN position. System will automatically recalibrate.

TROUBLE SHOOTING

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SELF-DIAGNOSTIC SYSTEM

Self-diagnostic system monitors system sensors, temperature valve position, refrigerant pressure and PCM signal. If a problem is detected, a Diagnostic Trouble Code (DTC) is stored in A/C-heater control panel memory. If a system fault is detected, a current and historical DTC will be set. When the failure is no longer detected, only the historical DTC will remain set.

A two-digit DTC is a current DTC, and a two-digit DTC proceeded by a "1" is an historical DTC. When parameter values from 200-299 are displayed, they appear as numbers 100-199 with a "-" in front of them. For example, value 200 would be displayed as "-100". Historical DTCs are set for 199 ignition cycles.

When counter gets to 199, all history DTCs will be cleared and counter will be set back to zero. If a DTC is set for the A/C system, the control unit will use a default value until the problem is corrected. Stored DTCs are displayed on A/C-heater control panel display. See **RETRIEVING** DTCs. After retrieving DTCs, perform appropriate DTC test procedure.

NOTE: The Powertrain Control Module (PCM) sets A/C-heater system related Diagnostic Trouble Code (DTC) P0530, DTC P1532, DTC P1533 and DTC P1539. See appropriate article in the ENGINE PERFORMANCE Section to service these DTCs.

RETRIEVING DTCS

Entering Self-Diagnostics

Press A/C-heater control panel TEMP (up arrow) switch and OFF switch at the same time. A segment check will be performed then graphic display will show pointer number "-00". Press blower motor speed (up arrow or down arrow) to increase or decrease pointer number. Press MIDDLE switch to change pointer number "-02" to DTC or parameter values for pointers "00-09".

To display A/C-heater system DTCs, select pointer number "-02", and press MIDDLE switch. Current and historical Diagnostic Trouble Codes (DTCs) will be displayed. A failure indicates that an open, short to ground or a faulty component in that circuit. See **DIAGNOSTIC TROUBLE CODE (DTC) IDENTIFICATION**. When a failure is detected, A/C-heater control panel uses a default value.

DIAGNOSTIC TROUBLE CODE (DTC) IDENTIFICATION

Code	Description
01	Outside Air Temp. Sensor Circuit Open
02	Outside Air Temp. Sensor Circuit Shorted
03	Inside Air Temp. Sensor Circuit Open
04	Inside Air Temp. Sensor Circuit Shorted
05	Sunload Sensor Circuit Open
06	Sunload Sensor Circuit Shorted
10	Temp. Air Mix Motor Circuit Open
11	Temp. Air Mix Motor Circuit Shorted
26	Serial Data Circuit Open Or Shorted
27	Invalid EEPROM Detected

Parameter Diagnostic Mode

While in diagnostic mode, several system parameters may be checked. To enter parameter diagnostic mode, press blower speed (up arrow) switch or blower speed (down arrow) switch. Parameter numbers are displayed at A/C-heater control panel. See **POINTER NUMBER PARAMETER IDENTIFICATION**. Once parameter is selected, press MIDDLE switch to display parameter diagnostic value.

POINTER NUMBER PARAMETER IDENTIFICATION

Pointer Numbers	Parameters
-02 - A/C System Diagnostic Trouble Codes	N/A
-05 - Program Number	(1) 0-255
-07 - Commanded Blower Motor Speed	(1) 0-128
-14 - Vehicle Speed	(2) MPH
-15 - Temperature Calibration Offset Learn Mode	(1) -5°F To 5°F
-18 - Sunload Sensor	(3) 0-255
-20 - Current Temperature Valve Position	(1) 0-255
-22 - Temperature Valve Full Cold Position	(4) 180-250
-23 - Temperature Valve Full Hot Position	(5) 5-60
-24 - Coolant Temperature	(6)
-25 - Temperature Valve Position Command	(7) 0-255
-27 - Air Delivery Mode	(8)
-28 - Inside Air Temperature Sensor	(9)

-31 - Outside Air Temperature Sensor	(10)
-37 - EEPROM Revision Number	(1)

(1) There is no default value used.

(2) Default value used is 25 MPH.

(3) Default value used is 240.

(4) Default value used 180.

(5) Default value used 60.

(6) Default value used 91°C.

(7) Default value used 128.

(8) See VACUUM DIAGNOSIS.

(9) Value increases as temperature decreases. See DTCs 03 and 04. Default value used 128 at 75°F (24° C).

(10) Value increases as temperature decreases. See DTCs 01 and 02. Default value used 128 at 49°F (9° C).

CLEARING DTCS & EXITING DIAGNOSTIC MODE

To erase stored DTCs from memory, press OFF switch on A/C-heater control panel, while in diagnostic pointer number "-02", when DTCs are displayed. To exit diagnostic mode, press AUTO switch on A/C-heater control panel.

NOTE: When all diagnosis and repairs are completed, clear DTCs and verify proper A/C-heater system operation.

A/C DIAGNOSTIC SYSTEM CHECK

NOTE: Before proceeding with symptom (i.e., improper air delivery, insufficient cooling, etc.) tests, A/C DIAGNOSTIC SYSTEM CHECK must be performed first.

1. Turn ignition switch to RUN position and enter diagnostics. Check if any Diagnostic Trouble Codes (DTCs) are displayed. If A/C-heater control panel is inoperative, see INOPERATIVE A/C-HEATER CONTROL PANEL under TESTING. If A/C-heater control panel is operative, but will not enter diagnostics, replace A/C-heater control panel. If any DTCs are displayed, perform appropriate DTC test procedure. If no DTCs are displayed, go to next step.
2. Exit diagnostics mode. Start engine. With ambient temperature of more than 50°F (10°C), select 60°F (16°C) on control panel and set blower switch to high speed. Blower motor and A/C compressor should operate.
3. If blower motor does not operate, go to BLOWER CONTROLS under TESTING. If blower motor and A/C compressor do not operate, go to BLOWER CONTROLS under TESTING and A/C COMPRESSOR CLUTCH CONTROLS - ALL MODELS article. If blower motor and A/C compressor operate, go to

appropriate symptom (i.e., improper air delivery, insufficient cooling, etc.) test under TESTING.

4. If A/C compressor does not operate, install manifold gauge set. Check that low side pressure is more than 55 psi (3.9 kg/cm^2). If pressure is not above 55 psi (3.9 kg/cm^2), leak test A/C system. If pressure is more than 55 psi (3.9 kg/cm^2), go to the article, **A/C COMPRESSOR CLUTCH CONTROLS** article.

DTC 01 - OUTSIDE AIR TEMPERATURE SENSOR CIRCUIT OPEN

1. Turn ignition switch to RUN position. Enter diagnostics and select pointer number "-02". Check for Diagnostic Trouble Codes (DTCs). If DTCs 03, 05 and 10 are present, repair open in Yellow wire between temperature sensor to A/C-heater control panel connector terminal D1. See **Fig. 2**. If Yellow wire is okay or no DTCs are present, press OFF switch. Exit diagnostics and go to next step.
2. Unplug outside air temperature sensor, located at hood latch support. Using an ohmmeter, measure resistance between sensor terminals. Compare resistance measurements to specifications shown in OUTSIDE AIR TEMPERATURE SENSOR SPECIFICATIONS table. If sensor resistance is within specification, go to next step. If temperature sensor resistance is not within specification, replace sensor.

OUTSIDE AIR TEMPERATURE SENSOR SPECIFICATIONS

Vehicle Inside Air Temp. °F (°C) (1)	Temperature Sensor (2) Ohms	Outside Air Temp. Input No. "-31".
23 (-5)	12,282	174
32 (0)	9407	158
41 (5)	7273	143
50 (10)	5666	127
59 (15)	4447	112
68 (20)	3514	98
77 (25)	2795	85
86 (30)	2237	73
95 (35)	1802	63
104 (40)	1459	54

(1) Plus or minus 5°F (3°C).

(2) Resistance values are approximate.

3. Using a voltmeter, measure voltage between outside temperature sensor connector terminal "A" (Light Green/Black wire) and ground. If voltage is 4.5-5.5 volts, go to next step. If voltage is more than 5.5 volts, check for short to battery voltage in Light Green/Black wire. If wire is okay, replace A/C-heater control panel.
4. Using an ohmmeter, check continuity between temperature sensor connector terminal "B" (Yellow wire) and ground. If continuity is not present, repair open circuit in Yellow wire. If continuity is present, check A/C-heater control panel connections. If connections are okay, reconnect control panel, sensor and all connectors. Clear DTCs. Recheck for DTCs. If DTCs reset, replace A/C-heater control panel. If DTCs do not reset, go to next step.
5. Visually inspect sensor connector and harness for damage or corrosion. Measure resistance between

sensor terminals. Sensor resistance should be 282-100,700 ohms. If resistance is not within specification, replace sensor.

DTC 02 - OUTSIDE AIR TEMPERATURE SENSOR CIRCUIT SHORT

1. Turn ignition switch to RUN position. Enter diagnostics and select pointer number "-02". Check for Diagnostic Trouble Codes (DTCs). Press OFF switch. Exit diagnostics mode.
2. Disconnect outside air temperature sensor, located at hood latch support. Using an ohmmeter, measure resistance between sensor terminals. Compare resistance measurements to specifications shown in OUTSIDE AIR TEMPERATURE SENSOR SPECIFICATIONS table. If temperature sensor resistance is within specification, go to next step. Replace temperature sensor if resistance is not within specification.
3. Disconnect A/C-heater control panel connector. Using an ohmmeter, check for short to ground at A/C-heater control panel connector terminal D3 (Light Green/Black wire). See **Fig. 2**. If continuity exists, repair short to ground in Light Green/Black wire. If no continuity exists, check for intermittent short to ground in Light Green/Black wire. If wire is okay, clear DTCs. Recheck for DTCs. If DTC 02 resets, replace A/C-heater control panel. If DTC does not reset, go to next step.
4. Visually inspect sensor connector and harness for damage or corrosion. Measure resistance between sensor terminals. Sensor resistance should be 282-100,700 ohms. If resistance is not within specification, replace sensor.

DTC 03 - INSIDE AIR TEMPERATURE SENSOR CIRCUIT OPEN

1. Turn ignition switch to RUN position. Enter diagnostics and select pointer number "-02". Check for Diagnostic Trouble Codes (DTCs). If DTCs 01, 05 and 10 are present, repair open in Yellow wire between temperature sensor and A/C-heater control panel connector terminal D1. See **Fig. 2**. If Yellow wire is okay or no DTCs are present, press OFF switch. Exit diagnostics mode.
2. Disconnect inside air temperature sensor connector, located above glove box. Using an ohmmeter, measure resistance between sensor terminals. If resistance is 282-100,700 ohms, go to next step. If resistance is not within 282-100,700 ohms, replace sensor.
3. Using a voltmeter, measure voltage between sensor connector terminal "A" (Dark Green wire) and ground. If voltage is between 4.5-5.5 volts, go to next step. If voltage is more than 5.5 volts, check Dark Green wire for short to battery voltage. If no short is present, replace A/C-heater control panel.
4. Check Yellow wire for continuity between inside air temperature sensor connector and ground. If continuity does not exist, repair open circuit in Yellow wire. If continuity exists, check A/C-heater control panel connections.
5. If connections are okay, reconnect all components. Clear DTCs and recheck for DTCs. If DTC 03 resets, replace A/C-heater control panel. If DTC does not reset, visually inspect sensor thermistor element for broken wires or contamination. Repair or replace as necessary.

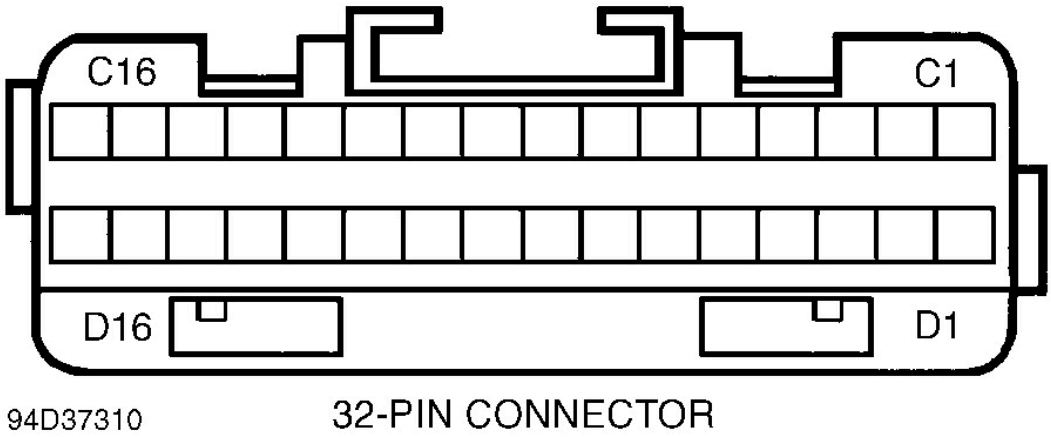

Fig. 2: Identifying A/C-Heater Control Panel Connector Terminals
Courtesy of GENERAL MOTORS CORP.

DTC 04 - INSIDE AIR TEMPERATURE SENSOR CIRCUIT SHORT

1. Turn ignition switch to RUN position. Enter diagnostics and select pointer number "-02". Check for Diagnostic Trouble Codes (DTCs). Press OFF switch. Exit diagnostics mode.
2. Disconnect air temperature sensor connector. Using an ohmmeter, measure resistance between sensor terminals. If sensor resistance is 282-100,700 ohms, go to next step. If sensor resistance is not within specification, replace sensor.
3. Disconnect A/C-heater control panel connector. Using an ohmmeter, check for continuity between connector terminal D2 (Dark Green wire) and ground. See **Fig. 2**. If continuity is present, repair short to ground in Dark Green wire. If continuity is not present, check for intermittent short to ground in Dark Green wire.
4. If Dark Green wire is okay, clear DTCs. Recheck for DTCs. If DTC 04 resets, replace A/C-heater control panel. If DTC does not reset, visually inspect sensor thermistor element for broken wires or contamination. Repair or replace as necessary.

DTC 05 - SUNLOAD SENSOR CIRCUIT OPEN

NOTE: When all diagnosis and repairs are completed, clear DTCs and verify proper system operation.

1. Turn ignition switch to RUN position. Enter diagnostics and select pointer number "-02". Check for Diagnostic Trouble Codes (DTCs). If DTCs 01, 03 and 10 are present, repair open in Yellow wire between temperature sensor and A/C-heater control panel connector terminal D1. See **Fig. 2**. Press OFF switch. Exit diagnostics mode.
2. Turn ignition off. Disconnect sunload sensor connector, located under center windshield defroster grille. Turn ignition to RUN position. Using a voltmeter, measure voltage between sensor harness connector

Light Blue/Black wire and ground. If voltage is between 4.5-5.5 volts, go to next step. If voltage is more than 5.5 volts, check Light Blue/Black wire for short to battery voltage. If wire is okay, replace A/C-heater control panel.

3. Using an ohmmeter, check for continuity between harness connector terminal "B" (Yellow wire) and ground. If continuity is not present, repair open circuit in Yellow wire. If continuity is present, replace sensor.

DTC 06 - SUNLOAD SENSOR CIRCUIT SHORT

1. Turn ignition switch to RUN position. Enter diagnostics and select pointer number "-02". Check for Diagnostic Trouble Codes (DTCs). Press OFF switch. Exit diagnostics mode.
2. Turn ignition off. Disconnect sunload sensor connector, located 5under center windshield defroster grille. Disconnect A/C-heater control panel connector. Using an ohmmeter, check for continuity between Light Blue/Black wire at connector and ground.
3. If continuity is present, repair short to ground in Light Blue/Black wire. If continuity is not present, check for intermittent short in Light Blue/Black wire. If wire is okay, reconnect all components. Recheck for DTCs. If DTC 06 resets, replace A/C-heater control panel. If DTC does not reset, visually inspect sensor and connector for damage and repair or replace as necessary.

DTC 10 - TEMPERATURE AIR MIX MOTOR CIRCUIT OPEN

1. Turn ignition switch to RUN position. Enter diagnostics and select pointer number "-02". Check for Diagnostic Trouble Codes (DTCs). If DTCs 01, 03 and 05 are present, repair open in Yellow wire between air mix motor and A/C-heater control panel connector terminal D1. See **Fig. 2**. Press OFF switch. Exit diagnostics mode.
2. Turn ignition off. Disconnect temperature air mix motor connector. Turn ignition to RUN position. Using a voltmeter, measure voltage between ground and air mix motor connector terminal No. 9 (Brown/White wire), and between air mix motor connector terminal No. 10 (Light Blue wire). If voltage is 4.5-5.5 volts, go to step 4).
3. If voltage is more than 5.5 volts, check for short to battery voltage in Light Blue or Brown/White wires. If wiring is okay, replace A/C-heater control panel. If voltage is not present, check for open in Light Blue or Brown/White wires. If wiring is okay, replace A/C-heater control panel.
4. Using an ohmmeter, check for continuity between air mix motor connector terminal No. 7 (Yellow wire) and ground. If continuity is present, go to next step. If continuity is not present, repair open in Yellow wire between air mix motor connector terminal No. 7 and splice.
5. Reconnect air mix motor and A/C-heater control panel connectors. Using a voltmeter, backprobe A/C-heater control panel connector terminal C8 (Brown/White wire). See **Fig. 2**. Measure voltage while changing temperature setting from 90°F (32°C) to 60°F (16°C). If voltage increases from one volt to 4 volts, go to next step. If voltage does not increase from one volt to 4 volts, check for open in Brown/White wire. If wire is okay, replace A/C-heater control panel.
6. Check A/C-heater control panel connections. If connections are okay, reconnect A/C-heater control panel connector. Clear DTCs. Recheck for DTCs. If DTC 10 resets, replace A/C-heater control panel. If DTC does not reset, go to next step.
7. Check for binding valve when removing or replacing air mix motor. Check for loose connections or bent pins at air mix motor connector. Change A/C-heater control panel temperature setting from full hot to full

cold and check air mix motor operation. If A/C-heater control panel voltage supply was disconnected, a new air mix motor was installed or temperature valve was disturbed, recalibrate A/C-heater control panel. See **ADJUSTMENTS**.

DTC 11 - TEMPERATURE AIR MIX MOTOR CIRCUIT SHORT

1. Turn ignition off. Disconnect A/C-heater control panel connector. Disconnect air mix motor connector. Using an ohmmeter, check for a short to ground between ground and air mix motor connector terminals No. 9 (Brown/White wire) and No. 10 (Light Blue wire). If continuity is not present, go to next step. If continuity is present, repair short to ground in Brown/White and Light Blue wires.
2. Reconnect A/C-heater control panel and air mix motor connectors. Using a voltmeter, backprobe A/C-heater control panel connector terminal C8 (Brown/White wire). See **Fig. 2**. Measure voltage while changing temperature setting from 90°F (32°C) to 60°F (16°C). Voltage should increase from about one volt to 4 volts. If voltage increases, go to next step. If voltage does not increase, check for open in Brown/White wire. If wire is okay, replace air mix motor.
3. Check A/C-heater control panel connections. If connections are okay, reconnect connector. Clear DTC. Recheck for DTCs. If DTC 11 resets, replace A/C-heater control panel. If DTC does not reset, go to next step.
4. Check for binding valve when removing or replacing air mix motor. Check for loose connections or bent pins at air mix motor connector. Change A/C-heater control panel temperature setting from full hot to full cold and check air mix motor operation. If A/C-heater control panel voltage supply was disconnected, a new air mix motor was installed or temperature valve was disturbed, recalibrate A/C-heater control panel. See **ADJUSTMENTS**.

DTC 26 - SERIAL DATA COMMUNICATION CIRCUIT OPEN, SHORTED TO GROUND OR SHORTED TO BATTERY VOLTAGE

1. Turn ignition switch to RUN position. Enter diagnostics and select pointer number "-02". Check for Diagnostic Trouble Codes (DTCs). Press OFF switch. Exit diagnostics mode.
2. Using a voltmeter, measure voltage between Data Link Connector (DLC) connector terminal No. 9 (Tan wire) and ground. If voltage is 4-5 volts, go to next step. If no voltage is present, repair open or short to ground in Tan wire. If voltage is more than 5 volts, repair a short to battery voltage in Tan wire.
3. Using a voltmeter, backprobe A/C-heater control panel connector terminal D12 (Tan wire). If voltage is 4-5 volts, go to next step. If voltage is not present, repair open in Tan wire.
4. Check A/C-heater control panel connections. If connections are okay, reconnect all connectors. Clear DTCs. Recheck for DTCs. If DTC 26 resets, replace A/C-heater control panel. If DTC does not reset, go to next step.
5. Check for intermittent open at A/C-heater control panel connector terminal D12 (Tan wire) and corresponding terminal at control unit. If DTC 26 is a current code, A/C-heater control panel will command A/C compressor clutch to be on. Looking at other systems on Tan wire circuit, using Tech 1 scan tester, and returning to A/C-heating control may cause DTC 26 to be falsely set. Clear DTCs, then recheck to see if DTC 26 is reset.

DTC 27 - INVALID EEPROM DETECTED

Turn ignition off. Wait 10 seconds. Turn ignition to RUN position and reenter diagnostics. Select pointer number "-02." Check for DTC 27. If DTC 27 is set, replace A/C-heater control panel. If DTC 27 is not set, check connections at A/C-heater control panel. Check that battery power, ignition source and ground to A/C-heater control panel are okay.

TESTING

WARNING: To avoid injury from accidental air bag deployment, read and carefully follow all SERVICE PRECAUTIONS and DISABLING & ACTIVATING AIR BAG SYSTEM procedures in the article, AIR BAG RESTRAINT SYSTEM, in the ACCESSORIES/SAFETY EQUIPMENT section

A/C SYSTEM PERFORMANCE

1. Park vehicle out of direct sunlight. Connect tachometer. Install manifold gauge set. Start engine. Turn A/C on. Place mode selector in A/C position, temperature control on maximum cooling and blower motor switch in HI position.
2. Close doors and windows and open hood. Place a high volume fan in front of radiator to ensure maximum airflow across condenser. Insert thermometer in right center air outlet. Idle engine for 10 minutes. Increase idle to 2000 RPM and measure temperature. Temperatures and pressures should be within correct range. See A/C SYSTEM PERFORMANCE TEMPERATURE SPECIFICATIONS and A/C SYSTEM PERFORMANCE PRESSURE SPECIFICATIONS tables.

A/C SYSTEM PERFORMANCE TEMPERATURE SPECIFICATIONS (1)

Ambient Temp. °F (°C)	Outlet Vent Temp. °F (°C)
70 (21) (2)	42 (6)
70 (21) (3)	43-52 (6-11)
80 (27) (2)	50-52 (10-11)
80 (27) (3)	54-62 (12-17)
90 (32) (2)	54-56 (12-13)
90 (32) (3)	60-72 (15-22)
100 (38) (2)	57-64 (14-18)
100 (38) (3)	69-78 (21-26)

(1) With engine at normal operating temperature and 2000 RPM.

(2) With relative humidity at less than 50 percent.

(3) With relative humidity at 50 percent or more.

A/C SYSTEM PERFORMANCE PRESSURE SPECIFICATIONS (1)

Ambient Temp. °F (°C)	High Side psi (kg/cm^2)	Low Side psi (kg/cm^2)
70 (21) (2)	190-200 (13.4-14.1)	23 (1.6)

70 (21) (3)	200-275 (14.1-19.3)	23-32 (1.6-2.2)
80 (27) (2)	250-285 (17.6-20.0)	30 (2.1)
80 (27) (3)	300-345 (21.1-24.3)	33-41 (2.3-2.9)
90 (32) (2)	300-320 (21.1-22.5)	35 (2.5)
90 (32) (3)	340-380 (23.9-26.7)	39-49 (2.7-3.4)
100 (38) (2)	330-370 (23.2-26.0)	37-43 (2.6-3.0)
100 (38) (3)	375-385 (26.4-27.1)	47-55 (3.3-3.9)

(1) With engine at normal operating temperature and 2000 RPM.

(2) With relative humidity at less than 50 percent.

(3) With relative humidity at 50 percent or more.

NORMAL SYSTEM RESPONSE TEST

Preliminary Information

Enter diagnostic mode by pressing OFF and TEMP up buttons at the same time. Using fan up or fan down button, select pointer number "-15". Press MIDDLE button to display current learn value. Press TEMP down and VENT buttons at the same time to enter LEARN MODE, (°F/°C will illuminate). Press TEMP up or TEMP down to change temperature calibration test offset. The learn value can be changed plus or minus 5°F (3°C). To lock new learn value into A/C-heater control panel, press and hold VENT and front defrost buttons for 5 seconds. Value will blink off and on, indicating a new learn value has been locked into memory.

System Response Test

1. When A/C-heater control panel OFF button is pressed, EXT TEMP will display ambient temperature. Blower motor does not operate.
2. When A/C-heater control panel AUTO button is pressed and temperature is set to 60°F (16°C), system is in recirculation mode. Blower motor will operate at high speed. Air will flow from instrument panel outlets. Engine idle speed will increase and A/C compressor clutch will be energized if ambient temperature is more than 35°F (2°C). Outlet air will become cold.
3. When A/C-heater control panel LO (fan) button is pressed, blower motor speed will reduce until button is released. Blower motor speed will be displayed until button is released. Blower motor will operate at speed attained when button is released.
4. When A/C-heater control panel HI (fan) button is pressed, blower motor speed will increase until button is released. Blower motor speed will be displayed until button is released. Blower motor will operate at speed attained when button is released.
5. When A/C-heater control panel ECON button is pressed, A/C compressor clutch will de-energize and outlet air will become warm.
6. When A/C-heater control panel AUTO button is pressed and temperature is set to 90°F (32°C), system is in heater mode. Blower motor will operate at high speed. Air will flow from floor outlet with some bleed to front and side window defroster outlets and outlet air will become warm.

7. When A/C-heater control panel AUTO button is pressed and temperature is set to 75°F (24°C), blower motor speed will reduce as in-vehicle temperature approaches 75°F (24°C). A/C-heater system will maintain in-vehicle temperature at about 75°F (24°C).
8. When A/C-heater control panel DEFOG button is pressed, system will be placed in manual mode. Air will flow from windshield outlet, side window outlets with a 50 percent bleed to floor outlets.
9. When A/C-heater control panel DEF (front) button is pressed, some air will bleed to heater outlets. Air will flow from windshield outlet and side window outlets.
10. When A/C-heater control panel REAR DEFOGGER button is pressed, will activate rear defogger for 10 minutes. Pressing REAR DEFOGGER button again during the same ignition cycle, will activate rear defogger for another 5 minutes.
11. When A/C-heater control panel BLEND button is pressed, system will be placed in manual mode. Airflow will be 50 percent from instrument panel outlets and 50 percent from floor outlets.
12. When A/C-heater control panel MIDDLE button is pressed, system will be placed in manual mode. Airflow will be 100 percent from instrument panel outlets.
13. When A/C-heater control panel FLOOR button is pressed, system will be in manual mode. Airflow will be 100 percent from floor outlets.

A/C COMPRESSOR CLUTCH CONTROLS

NOTE: See A/C COMPRESSOR CLUTCH CONTROLS article.

AUTOMATIC A/C SYSTEM FUNCTIONAL CHECK

1. Perform these steps to verify A/C control system is functioning properly, or after performing temperature air valve recalibration. See ADJUSTMENTS. If any problems are encountered, diagnose and repair them before proceeding through following steps.
2. With outside temperature at least 50°F (10°C), idle engine until it is warm. Place system in AUTO mode and set temperature for maximum heat. After 30 seconds, check for a strong flow of warm air from the floor outlet. This indicates blower high speed is working.
3. Change temperature to maximum cooling. Blower speed should diminish momentarily, then increase again to high speed. During the shift, air should begin to flow from instrument panel outlets. Air flow from floor outlet should stop. Operate at maximum cooling for one minute. Discharge temperature at center outlet should be at least 20°F (7°C) lower than ambient temperature.
4. With engine still running, change temperature setting to any number higher than inside vehicle temperature. Air inlet valve should close. Valve closing should be heard and a reduction of blower motor speed should be noticed.

VACUUM DIAGNOSIS

1. Perform IMPROPER AIR DELIVERY procedure. If A/C-heater control panel performs as specified, start engine. Measure vacuum supply at engine manifold and solenoid module side of vacuum tank (Black vacuum hose). Vacuum should be about 15-16 in. Hg. Turn engine off. Vacuum should hold at about 15-16 in. Hg. Repair vacuum leak as necessary.
2. Test each vacuum actuator by disconnecting vacuum hose and applying vacuum directly to actuator.

Repair or replace actuators as necessary.

3. Reconnect all vacuum hoses and electrical wiring. Start engine. Cycle through operating modes of A/C-heater control panel while observing vacuum actuators. See AIR DELIVERY VACUUM DISTRIBUTION table. Check for vacuum to actuators by noting actuator position. When vacuum is applied, actuator should retract.
4. If any vacuum actuator retracts when it should not, replace A/C-heater control panel. If any vacuum actuator does not retract when it should, check for vacuum leaks, collapsed vacuum hoses and binding valves. Repair or replace components as necessary. If no leaks, collapsed hoses or binding valves exist, replace solenoid module.

AIR DELIVERY VACUUM DISTRIBUTION

A/C-Heater Control Panel Position	Gray Hose Defrost	Orange Hose Air Inlet	Tan Hose Middle	Red Hose Def/Heater	Blue Hose Heater
OFF	No Vacuum	No Vacuum	No Vacuum	Vacuum	No Vacuum
RECIRC	No Vacuum	Vacuum	Vacuum	No Vacuum	No Vacuum
MIDDLE	No Vacuum	No Vacuum	Vacuum	No Vacuum	No Vacuum
BLEND	No Vacuum	No Vacuum	No Vacuum	No Vacuum	Vacuum
FLOOR	No Vacuum	No Vacuum	No Vacuum	Vacuum	Vacuum
DEFOG	No Vacuum	No Vacuum	No Vacuum	Vacuum	No Vacuum
DEFROST	Vacuum	No Vacuum	No Vacuum	Vacuum	No Vacuum

IMPROPER AIR DELIVERY

1. Turn ignition switch to RUN position. Turn A/C-heater control panel to AUTO at 75°F (24°C). Using a test light connected to ground, backprobe terminal No. 6 (Brown wire) of vacuum/electric solenoid. See **Fig. 3**. If test light glows, go to next step. If test light does not glow, repair open or short to ground in Brown wire.
2. Turn ignition off. Disconnect vacuum/electric solenoid connector. Using ohmmeter, measure resistance between vacuum/electric solenoid terminal No. 6 (Brown wire) and vacuum/electric solenoid terminals No. 1 (Light Green wire), 2 (Red wire), 3 (Purple wire), 4 (Tan wire), and 5 (Light Blue wire). If resistance is 70-120 ohms for all terminals, go to next step. If resistance is not 70-120 ohms for all terminals, check vacuum/electric solenoid connections. If connections are okay, replace vacuum/electric solenoid.
3. Connect vacuum/electric solenoid connector. Turn ignition switch to RUN position. Turn A/C-heater control panel to OFF position. Using a test light connected to battery voltage, backprobe vacuum/electric solenoid terminals No. 1 (Light Green wire), No. 2 (Red wire), No. 3 (Purple wire), No. 4 (Tan wire) and No. 5 (Light Blue wire). If test light glows at terminal No. 4, and does not glow at all other terminals, go to step 5). If test light does not glow as specified, go to next step.
4. Check for open or short to battery voltage in Tan wire. Check for short to ground in Light Green wire, Red wire, Purple wire and Light Blue wire circuits. Check connections at A/C-heater control panel connections. If wiring and connections are okay, replace A/C-heater control panel.
5. Check for short to ground in Tan wire and repair as necessary. If Tan wire is okay, turn A/C-heater control panel to AUTO and temperature to 60°F (16°C). Using a test light connected to battery voltage,

backprobe vacuum/electric solenoid connector terminals No. 1 (Light Green wire), No. 2 (Red wire), No. 3 (Purple wire), No. 4 (Tan wire) and No. 5 (Light Blue wire). If test light glows at terminals No. 2 and 3, and does not glow at terminals No. 1, 4 and 5, go to step 7). If test light does not glow as specified, go to next step.

6. Check for open or short to battery voltage on Red wire and Purple wire circuits. Check for short to ground in Light Green wire, Tan wire and Light Blue wire circuits. Check A/C-heater control panel connections. If circuits and connections are okay, replace A/C-heater control panel.
7. Check for short to ground in Red wire and Purple wire circuits. If circuits are okay, turn A/C-heater control panel to AUTO and set temperature to 90°F (32°C). Using a test light connected to battery voltage, backprobe vacuum/electric solenoid connector terminals No. 1 (Light Green wire), No. 2 (Red wire), No. 3 (Purple wire), No. 4 (Tan wire) and No. 5 (Light Blue wire). If test light glows at terminals No. 4 and 5, and does not glow at terminals No. 1, 2 and 3, go to next step. If test light does not glow as specified, check A/C-heater control panel connections. If connections are okay, replace A/C-heater control panel.
8. Check for short to ground in Tan and Light Blue wire circuits. If circuits are okay, turn A/C-heater control panel to BLEND position. Using a test light connected to battery voltage, backprobe vacuum/electric solenoid connector terminals No. 1 (Light Green wire), No. 2 (Red wire), No. 3 (Purple wire), No. 4 (Tan wire) and No. 5 (Light Blue wire). If test light glows at terminal No. 5, and does not glow at terminals No. 1, 2, 3 and 4, go to next step. If test light does not glow as specified, check A/C-heater control panel connections. If connections are okay, replace A/C-heater control panel.
9. Push A/C-heater control panel button for front defroster mode. Using a test light connected to battery voltage, backprobe vacuum/electric solenoid connector terminals No. 1 (Light Green wire), No. 2 (Red wire), No. 3 (Purple wire), No. 4 (Tan wire) and No. 5 (Light Blue wire). If test light glows at terminals No. 1 and 4, and does not glow at terminals No. 2, 3 and 5, go to next step. If test light does not glow as specified, check A/C-heater control panel connections. If connections are okay, replace A/C-heater control panel.
10. Check for short to ground in Light Green wire and Tan wire circuits. If circuits are okay, push A/C-heater button for DEFOG mode. Using a test light connected to battery voltage, backprobe terminals No. 1 (Light Green wire), No. 2 (Red wire), No. 3 (Purple wire), No. 4 (Tan wire) and No. 5 (Light Blue wire). If test light glows at terminal No. 4, and does not glow at terminals No. 1, 2, 3 and 5, A/C-heater system is functioning properly. Perform VACUUM DIAGNOSIS. If test light does not glow as specified, check connections at A/C-heater control panel. If connections are okay, replace A/C-heater control panel.

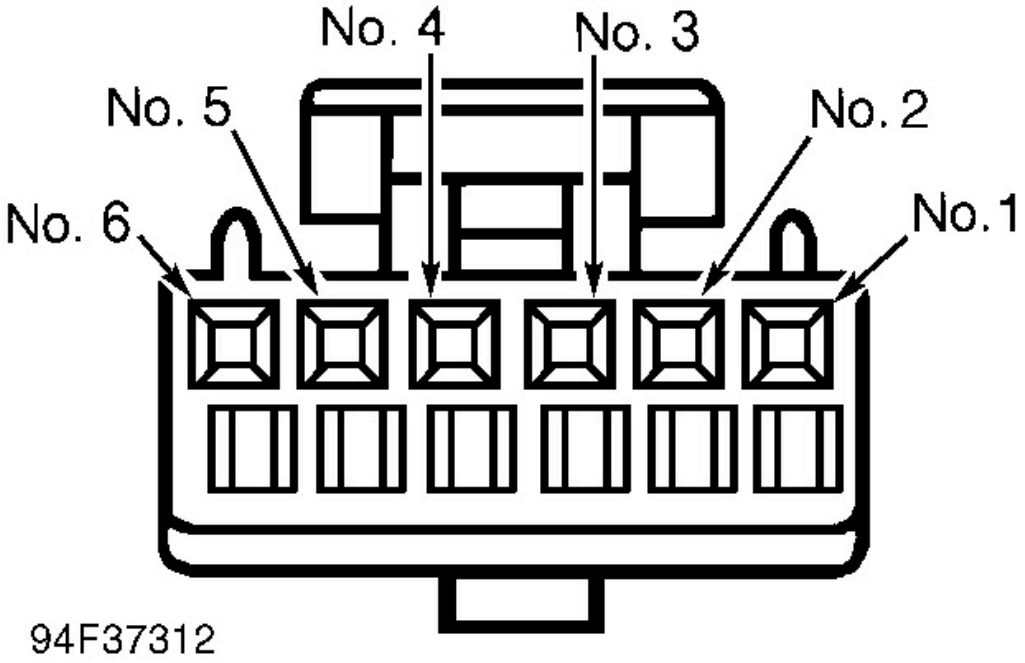

Fig. 3: Identifying Solenoid Module Harness Connector Terminals
Courtesy of GENERAL MOTORS CORP.

INSUFFICIENT OR NO HEATING

1. Start engine and allow it to reach normal operating temperature. Select AUTO mode and set temperature to 90°F (32°C). Blower motor should be in high speed and a large volume of heated air should come out of floor vents at about 140°F (60°C). If air delivery and temperature are correct, go to step 8). If blower motor does not run at proper speed, go to BLOWER MOTOR WILL NOT RUN IN ANY MODE or BLOWER MOTOR RUNS CONSTANTLY OR HIGH SPEED ONLY. If air delivery is improper, go to IMPROPER AIR DELIVERY. If air temperature is incorrect, go to next step.
2. Enter diagnostic mode. Select pointer number "-20" (current temperature valve position). Display and record value. Select pointer number "-25" (commanded temperature valve position). Display and record value. If values are within plus or minus 5 of each other, go to step 5). If values are not within plus or minus 5 of each other, go to next step.
3. Disconnect temperature air mix motor connector. Turn ignition to RUN position. Using a voltmeter, measure voltage at electric air mix motor connector terminal No. 5 (Brown wire). If battery voltage is present, go to next step. If battery voltage is not present, repair open in Brown wire between electric air mix motor connector terminal No 5 and splice.
4. Set temperature to 90°F (32°C). Using voltmeter, measure voltage at air mix motor connector terminal No. 6 (Dark Blue wire). If voltage is more than .5 volt, check for short to battery voltage in Dark Blue

wire. If Dark Blue wire is okay, replace A/C-heater control panel. If voltage is less than .5 volt, replace electrical air mix motor.

5. Exit diagnostics. Select AUTO mode and set temperature to 90°F (32°). Turn ignition off. Disconnect temperature air mix motor connector. Remove air mix motor.

CAUTION: Operating temperature air mix motor when disconnected from A/C-heater control panel may result in damage to air mix motor.

6. Start engine. Select AUTO mode and set temperature to 90°F (32°C). Ensure blower motor is operating on highest speed. Manually rotate temperature valve from stop to stop (about 65 degrees) and note air temperature and valve position. If air temperature changes from ambient temperature to at least 120°F (49°C), reinstall air mix motor and recalibrate air temperature valve. See ADJUSTMENTS. If problem still exists, replace air mix motor.
7. If temperature does not change, inspect heater core for air restrictions through cooling fins. If restrictions are found, replace heater core. If no restrictions are found, replace heater and evaporator assembly.
8. Select AUTO mode and set temperature to 75°F (24°C). If interior temperature stabilizes at 70-80°F (21-27°C), A/C-heater system is functioning properly. If temperature does not stabilize, go to next step.
9. Remove right side instrument panel molding. Set blower motor to highest speed. Place a 2 X 2 inch (50 X 50 mm) piece of paper over air slots just above glove box. If paper is held, go to next step. If paper is not held, repair or replace inside air temperature sensor duct.
10. Check air passages in instrument panel molding for restrictions. If restrictions are found replace instrument panel molding. If no restrictions are found, open glove box door past stops. Disconnect inside air temperature sensor connector. Using an ohmmeter, measure sensor resistance and inside vehicle air temperature. Compare sensor resistance and temperature to specifications. See INSIDE AIR TEMPERATURE SENSOR SPECIFICATIONS table. If values are not within specifications, replace inside air temperature sensor. If values are within specifications, replace A/C-heater control panel.

INSIDE AIR TEMPERATURE SENSOR SPECIFICATIONS

Vehicle Inside Air Temp. °F (° C) (1)	Temperature Sensor (2) Ohms	Inside Air Temp. Input No. "-28"
23 (-5)	12,282	208
32 (0)	9407	197
41 (5)	7273	184
50 (10)	5666	171
59 (15)	4447	156
68 (20)	3514	142
77 (25)	2795	127
86 (30)	2237	113
95 (35)	1802	100
104 (40)	1459	87

(1) Reading may be plus or minus 5°F (3°C).

(2) Resistance values are approximate.

INSUFFICIENT OR NO COOLING

1. Ambient temperature should be at least 50°F (10°C). Place auxiliary fan in front of condenser. Start engine. Select AUTO mode and set temperature to 60°F (16°C). Blower motor should be running at high speed after 3 minutes of operation. A large volume of air should come out of instrument panel vents at least 20°F (7°C) cooler than ambient temperature.
2. If air delivery and temperature are correct, A/C-heater system is functioning properly. If both air delivery and temperature are incorrect, go to step 9). If blower motor does not run at proper speed, go to BLOWER CONTROLS. If air delivery is improper, go to IMPROPER AIR DELIVERY. If air temperature is incorrect, go to next step.
3. Enter diagnostics (both TEMP up arrow and OFF buttons must be pushed at same time or function or setting may change). Select pointer number "-05" and display value. If display shows 10 counts, go to next step. If display does not show 10 counts, replace A/C-heater control panel.
4. Select pointer number "-20" (current temperature valve position). Display and record value. Select pointer number "-25" (commanded temperature valve position). Display and record value. If values are not within plus or minus 3 of each other, go to next step. If values are within plus or minus 3 of each other, go to step 7).
5. Disconnect temperature valve electric air mix motor connector. Turn ignition switch to RUN position. Using voltmeter, measure voltage at electric air mix motor connector terminal No. 5 (Brown wire). If battery voltage is present, go to next step. If battery voltage is not present, repair open in Brown wire.
6. Set temperature to 60°F (16°C). Using voltmeter, measure voltage at electric air mix motor connector terminal No. 6 (Dark Blue wire). If voltage is 4.5-5.5 volts, replace electric air mix motor. If voltage is more than 5.5 volts, check for short to battery voltage in Dark Blue wire. If wire is okay, replace A/C-heater control panel. If voltage is less than 4.5 volts, check for short to ground in Dark Blue wire. If wire is okay, replace A/C-heater control panel.
7. Exit diagnostics. Set temperature to 60°F (16°C). Turn ignition off. Disconnect temperature air mix motor connector. Remove air mix motor.

CAUTION: Operating air mix motor when disconnected from A/C-heater control panel may result in damage to air mix motor.

8. Start engine. Manually rotate temperature valve clockwise until it seats at full cold position. If valve seats fully, go to step 12). If valve does not seat fully, replace heater and evaporator assembly.
9. Set blower motor to highest speed. Place a 2 X 2 inch (50 X 50 mm) piece of paper over inside air temperature sensor duct opening just above glove box. Proper air flow through sensor should hold paper against opening. If paper is not held, repair or replace inside air temperature sensor duct. If paper is held, go to next step.
10. Check air passages in instrument panel molding for restrictions. If no restrictions are found, go to next step. If restrictions are found, replace instrument panel molding.
11. Open glove box door past its stops. Disconnect inside air temperature sensor connector. Using ohmmeter, measure air temperature sensor resistance and vehicle inside air temperature. Compare resistance and temperature to specifications. See INSIDE AIR TEMPERATURE SENSOR SPECIFICATIONS table. If values are not within specifications, replace inside air temperature sensor. If values are within specifications, replace A/C-heater control panel.

12. Measure air outlet temperature. If temperature is not at least 20°F (7°C) cooler than ambient temperature, go to next step. If temperature is at least 20°F (7°C) cooler than ambient temperature, reinstall air mix motor and recalibrate system. See ADJUSTMENTS. If problem still exists, replace air mix motor.
13. Check evaporator for restrictions. If restrictions are found, repair or replace evaporator assembly. If no restrictions are found, replace evaporator assembly.

REFRIGERANT SYSTEM CHECK

1. Ensure ambient temperature is at least 50°F (10°C). Check for restricted air flow at condenser and correct as necessary. Place auxiliary fan in front of radiator if vehicle is not equipped with engine driven fan. Start and run engine at 2000 RPM. Select AUTO mode and set temperature to 60°F (16°C). Enter diagnostics and select pointer number "-02". If EXT TEMP graphic is not displayed on A/C-heater control panel, go to next step. If EXT TEMP graphic is displayed on A/C-heater control panel, go to step 3).
2. If EXT TEMP graphic is not displayed, A/C-heater control panel is not requesting compressor operation. Select pointer number "-31" and display value. If value is 141 or less, replace A/C-heater control panel. If value is more than 141, go to INCORRECT OUTSIDE AIR TEMPERATURE DISPLAY.
3. Check that compressor clutch is engaged. If clutch is not engaged, go to A/C COMPRESSOR CLUTCH CONTROLS - ALL MODELS article. If clutch is engaged, check that primary electric cooling fan operates when compressor is engaged (if not equipped with engine driven cooling fan). If cooling fan does not operate, go to ELECTRIC COOLING FANS - ALL MODELS article.
4. Perform A/C SYSTEM PERFORMANCE test. If pressures are not within specification, check for moisture or restrictions in system. Check refrigeration system. If pressures are within specification, observe low side pressure as compressor cycles on and off. If compressor disengages at about 24 psi (1.7 kg/cm^2), and engages at about 45 psi (3.2 kg/cm^2), system is functioning properly and test is complete. If compressor does not engage or disengage at specified pressures, replace pressure cycling switch.

INOPERATIVE A/C-HEATER CONTROL PANEL

1. Using a voltmeter, backprobe between A/C-heater control panel connector terminals C12 (Orange wire) and C1 (Black/White wire). If battery voltage is present, go to next step. If battery voltage is not present, check Black/White wire for open or short to battery voltage between terminal C1 and ground. If Black/White wire is okay, check Orange wire for an open or short to ground. If wiring is okay, repair poor mating connection between A/C-heater control panel and control unit connector.
2. Turn ignition to RUN position. Using a voltmeter, backprobe A/C-heater control panel connector between terminals C5 (Brown wire) and C1 (Black/White wire). If battery voltage is not present, repair open or short to ground in Brown wire. If battery voltage is present, replace A/C-heater control panel.

INCORRECT OUTSIDE AIR TEMPERATURE DISPLAY

NOTE: Before proceeding with this test, A/C DIAGNOSTIC SYSTEM CHECK must be performed first.

NOTE: When all diagnosis and repairs are completed, clear DTCs and verify proper system operation.

1. Enter diagnostics. Select pointer number "-31" (outside air temperature sensor input). Display and record value. Compare resistance value and outside air temperature. See OUTSIDE AIR TEMPERATURE SENSOR SPECIFICATIONS table. If resistance is within specifications, go to next step. If resistance is not within specifications, go to step 4).

OUTSIDE AIR TEMPERATURE SENSOR SPECIFICATIONS

Vehicle Inside Air Temp. °F (°C) (1)	Temp. Sensor (2) Ohms	Outside Air Temp. Input No. "-31"
23 (-5)	12,282	174
32 (0)	9407	158
41 (5)	7273	143
50 (10)	5666	127
59 (15)	4447	112
68 (20)	3514	98
77 (25)	2795	85
86 (30)	2237	73
95 (35)	1802	63
104 (40)	1459	54

(1) Plus or minus 5°F (3°C)

(2) Resistance values are approximate.

2. Allow sufficient time for system to update sensor readings. This requires that ignition be turned off for more than 3 hours, or if ignition is turned off for less than 3 hours, engine coolant must be within 50°F (10°C) of outside temperature. If these conditions are not met, outside temperature displayed during previous ignition cycle will be displayed. Enter diagnostics. Select pointer number "-31." Display and record values. Compare resistance value and outside air temperature. See OUTSIDE AIR TEMPERATURE SENSOR SPECIFICATIONS table. If specifications are correct, go to next step. If specifications are not correct, replace A/C-heater control panel.
3. Incorrect temperature display may be an intermittent problem. Check for historical DTC 01 or 02. While these DTCs are current, the A/C-heater control panel will use a default temperature. See POINTER NUMBER PARAMETERS IDENTIFICATION table. There will be no indication that these DTCs occurred other than incorrect temperature display. Enter diagnostic display and retrieve DTCs. Tap on outside of sensor and wiggle sensor wiring and connectors. If DTC 01 or 02 sets, repair connector or replace outside air temperature sensor.
4. Exit diagnostics. Disconnect outside air temperature sensor connector. Measure resistance across sensor terminals. Compare resistance value and outside air temperature. See OUTSIDE AIR TEMPERATURE SENSOR SPECIFICATIONS table.
5. If specifications are not correct, replace sensor. If specifications are correct, remove A/C-heater control panel. Check for poor connections and/or excessive resistance in Light Green/Black and Yellow wires. If resistance and connections are okay, replace the A/C-heater control panel.

BLOWER CONTROLS

NOTE: When all diagnosis and repairs are completed, clear DTCs and verify proper system operation.

Preliminary Checks

Check HVAC MOD FUSE fuse (30-amp), located in instrument panel fuse block. Check for corrosion on connector terminals at blower motor and blower motor control module (A/C power module). See **Fig. 4**. Repair components as necessary. Ensure ground connections are secure. If blower motor can be controlled in either manual or automatic mode but not both, temporarily substitute known good A/C-heater control panel. Retest system.

Blower Motor Will Not Run In Any Mode

1. Turn ignition to RUN position and A/C-heater control panel to AUTO. Using voltmeter, backprobe blower motor control module C1 connector terminal "B" (Gray/Black wire). Set blower speed to lowest speed setting. Slowly increase blower speed while observing voltmeter. If voltage varies with blower speed setting, go to next step. If voltage does not vary with blower speed setting, check for open or short to ground in Gray/Black wire between blower motor control module and A/C-heater control panel. If Gray/Black wire is okay, replace A/C-heater control panel.
2. Disconnect blower motor control module C2 connector. Using voltmeter, measure voltage between ground and blower motor control module C2 connector terminal "B" (Orange wire). If battery voltage exists, go to next step. If battery voltage does not exist, repair open or short to ground Orange wire between blower motor control module C2 connector and HVAC MOD FUSE fuse.
3. Using voltmeter, measure voltage between blower motor control module C2 connector terminal "B" (Orange wire) and C1 connector terminal "C" (Black wire). If battery voltage exists, go to next step. If battery voltage does not exist, repair open in Black wire.
4. Turn ignition off. Reconnect blower motor control module connectors. Disconnect blower motor connector. Using voltmeter, measure voltage between ground and blower motor connector terminal "B" (Purple wire). Turn ignition to RUN position. Set blower motor speed to lowest setting. Slowly increase blower motor speed setting. If voltage varies with blower motor speed setting, go to next step. If voltage does not vary with blower motor speed setting, check for open or short to ground in Purple wire between A/C-heater control panel, blower motor, and blower motor module. If Purple wire is okay, replace blower motor control module.
5. Using voltmeter, measure voltage between blower motor control module C2 connector terminal "B" (Orange wire) and blower motor connector terminal "A" (Black wire). If battery voltage exists, check for corrosion on blower motor terminals. If terminals are okay, replace blower motor. If battery voltage does not exist, repair open in Black wire.

Blower Motor Runs Constantly Or In High Speed Only

1. Disconnect A/C-heater control panel connector. Turn ignition to RUN position. If blower motor operates, go to next step. If blower motor does not operate, check for open circuit in Purple wire between A/C-heater control panel connector terminal C9 and splice. If Purple wire is okay, replace A/C-heater control panel.
2. Turn ignition off. Disconnect blower motor control module C1 connector. Turn ignition to RUN position. If blower motor operates, repair short to battery voltage in Purple wire between A/C-heater control panel

connector terminal C9 and blower motor. If blower motor does not operate, repair short to battery voltage in Gray/Black wire between A/C-heater control panel connector terminal C11 and blower motor control module. If Gray/Black wire is okay, replace blower motor control module (A/C power module). See **Fig. 4**.

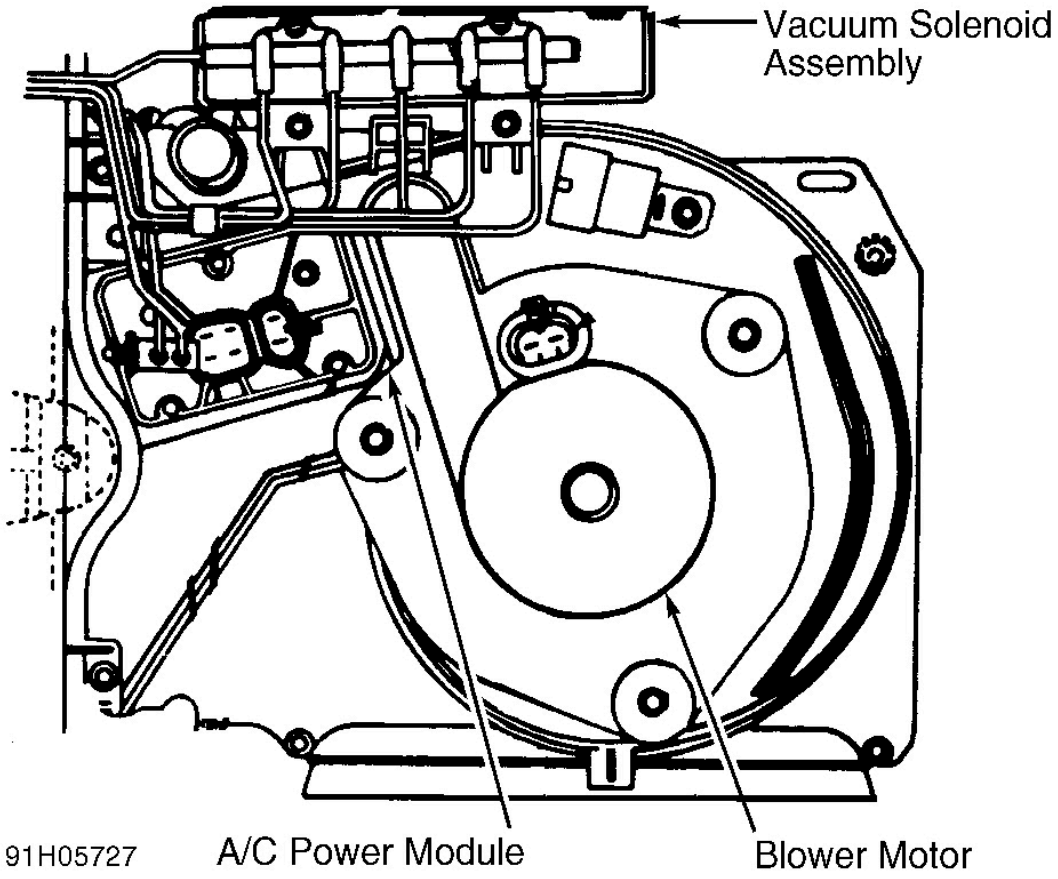

Fig. 4: Locating A/C Power Module
Courtesy of GENERAL MOTORS CORP.

REMOVAL & INSTALLATION

WARNING: To avoid injury from accidental air bag deployment, read and carefully follow all SERVICE PRECAUTIONS and DISABLING & ACTIVATING AIR BAG SYSTEM procedures in the article, AIR BAG RESTRAINT SYSTEM, in the ACCESSORIES/SAFETY EQUIPMENT section

NOTE: For removal and installation procedures not covered in this article, see A/C-HEATER SYSTEM - MANUAL article.

A/C-HEATER CONTROL PANEL

Removal & Installation

Disconnect negative battery cable. Remove trim plate screws. Pull trim plate away from instrument panel. Pull A/C-heater control panel from instrument panel enough to unplug electrical connectors. Remove A/C-heater control panel. Remove control lamps (if necessary). To install, reverse removal procedure.

BLOWER MOTOR CONTROL MODULE

Removal & Installation

1. Disconnect negative battery cable. Remove right side instrument panel sound insulator. Pull sound insulator back until locator studs at forward edge are disengaged.
2. Locate blower motor control module (A/C power module) on bottom of evaporator housing, just left of blower motor. See **Fig. 4**. Disconnect electrical connectors. Remove blower motor control module (A/C power module). To install, reverse removal procedure.

INSIDE AIR TEMPERATURE SENSOR

Removal & Installation

1. Remove instrument panel upper trim panel. Pull trim plate away from instrument panel. Open glove box door past its stops. Disconnect duct and electrical connector from sensor. Remove inside air temperature sensor.
2. To install, reverse removal procedure. After installing air temperature sensor, clear DTCs. See CLEARING DTCS & EXITING DIAGNOSTIC MODE under TROUBLE SHOOTING.

INSIDE AIR TEMPERATURE SENSOR DUCT

Removal & Installation

1. Disable air bag system. See DISABLING & ACTIVATING AIR BAG SYSTEM procedures in AIR BAG SYSTEM SAFETY article in GENERAL SERVICING. Remove instrument panel upper trim panel. Remove passenger-side air bag. Open glove box door past its stops. Remove air temperature sensor duct from sensor. Disconnect duct from aspirator on evaporator housing. Remove retainers by pulling straight out and remove ducts. To install, reverse removal procedure.

OUTSIDE AIR TEMPERATURE SENSOR

Removal & Installation

1. Disconnect outside air temperature sensor lead, near forward left corner of engine compartment. Remove clips from radiator support brace. Remove outside air temperature sensor from radiator support.
2. To install, reverse removal procedure. Ensure locating tab fits into hole in radiator support. After installing air temperature sensor, clear DTCs. See CLEARING DTCS & EXITING DIAGNOSTIC

MODE under TROUBLE SHOOTING.

SUNLOAD SENSOR

Removal & Installation

1. Unsnap and remove center windshield defroster nozzle grille from upper trim pad. Twist sunload sensor counterclockwise. Pull sensor from nozzle grille. Unplug harness connector. Remove sunload sensor.
2. To install sensor, reverse removal procedure. After installing sunload sensor, clear DTCs. See CLEARING DTCS & EXITING DIAGNOSTIC MODE under TROUBLE SHOOTING.

TEMPERATURE AIR MIX MOTOR

CAUTION: DO NOT operate temperature air mix motor unless it is installed.

Removal

Disconnect negative battery cable. Remove screws attaching glove box door to instrument panel. Remove glove box door and glove box. Disconnect electrical air mix motor connector. Remove air mix motor attaching screws. Pull air mix motor straight rearward and off air valve shaft.

Installation

To install, reverse removal procedure. Align metal drive sleeve of temperature air mix motor with flats on air valve shaft. Press air mix motor forward into position. Recalibrate air valve. See ADJUSTMENTS. After installing sunload sensor, clear DTCs. See CLEARING DTCS & EXITING DIAGNOSTIC MODE under TROUBLE SHOOTING.

VACUUM HOSE HARNESS

Removal & Installation

1. Turn ignition off. Disable air bag system. See DISABLING & ACTIVATING AIR BAG SYSTEM procedures in AIR BAG RESTRAINT SYSTEM article in the ACCESSORIES/SAFETY EQUIPMENT section. If access to hose connection at vacuum tank is necessary, remove passenger air bag inflator module. Pull module up and disconnect electrical connector. Remove module. Release vacuum hose manifold retainers and separate manifold from vacuum/electric solenoid.
2. Disconnect hose connector for engine compartment hoses, near vacuum/electric solenoid. Disconnect hose end connectors from vacuum tubes of actuators and vacuum tank. Slide connector from tube while holding tab back against body of connector. Note positions and routing of hoses. Remove vacuum hose harness. To install, reverse removal procedure.

VACUUM/ELECTRIC SOLENOID ASSEMBLY

Removal & Installation

Disconnect negative battery cable. Remove right side instrument panel sound insulator. Unplug harness connector from vacuum/electric solenoid assembly. Separate vacuum/electric solenoid assembly from evaporator assembly. See **Fig. 4**. Disconnect vacuum hoses from assembly. Remove vacuum hose manifold from vacuum solenoid assembly. To install, reverse removal procedure.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	INCH Lbs. (N.m)
A/C-Heater Control Panel Screw	17 (1.9)
Blower Motor Bolt	17 (1.9)
Electric Air Mix Motor Screw	17 (1.9)
Inside Air Temperature Sensor Screw	13 (1.5)
Outside Air Temperature Sensor Screw	89 (10)
Vacuum Solenoid Screw	17 (1.9)

VACUUM HOSE DIAGRAM(S)

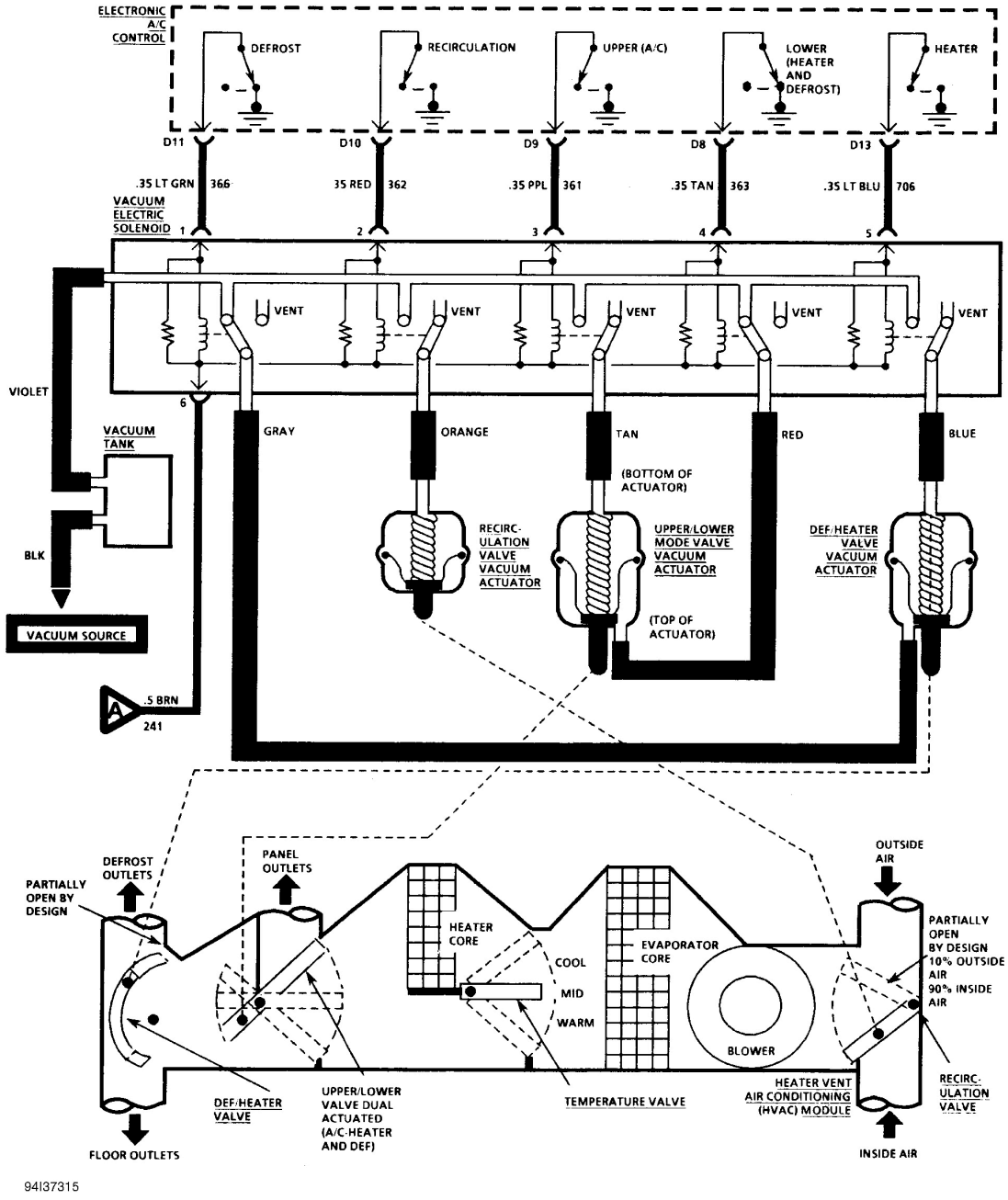

Fig. 5: Automatic A/C-Heater System Vacuum Diagram
Courtesy of GENERAL MOTORS CORP.

WIRING DIAGRAM

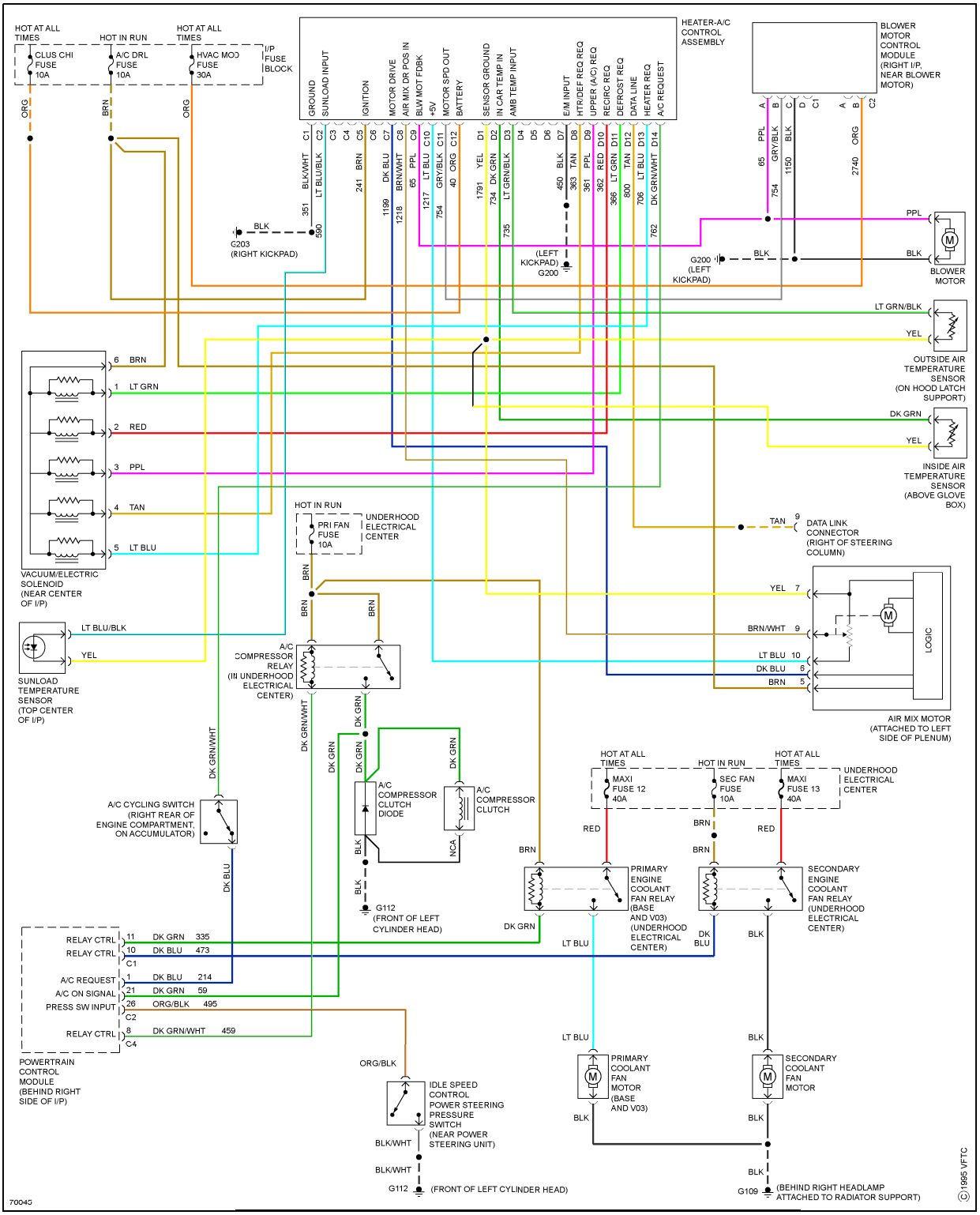
HOT AT ALL TIMES
HOT IN RUN
HOT AT ALL TIMES
CLUS CHI FUSE 10A
A/C DRL FUSE 10A
HVAC MOD FUSE 30A
I/P FUSE BLOCK
HEATER-A/C CONTROL ASSEMBLY
GROUND
SUNLOAD INPUT
IGNITION
MOTOR DRIVE
AIR MIX DR POS IN
BLW MOT FDBK
+5V
MOTOR SPD OUT
BATTERY
SENSOR GROUND
IN CAR TEMP IN
AMB TEMP INPUT
E/M INPUT
HTR/DEF REQ REQ
UPPER (A/C) REQ
RECIRC REQ
DEFROST REQ
DATA LINE
HEATER REQ
A/C REQUEST
BLOWER MOTOR CONTROL MODULE (RIGHT I/P, NEAR BLOWER MOTOR)
G203 (RIGHT KICKPAD)
(LEFT KICKPAD) G200
G200 (LEFT KICKPAD)
BLOWER MOTOR
OUTSIDE AIR TEMPERATURE SENSOR (ON HOOD LATCH SUPPORT)
INSIDE AIR TEMPERATURE SENSOR (ABOVE GLOVE BOX)
DATA LINK CONNECTOR (RIGHT OF STEERING COLUMN)
VACUUM/ELECTRIC SOLENOID (NEAR CENTER OF I/P)
HOT IN RUN
PRI FAN FUSE 10A
UNDERHOOD ELECTRICAL CENTER
SUNLOAD TEMPERATURE SENSOR (TOP CENTER OF I/P)
A/C COMPRESSOR RELAY (IN UNDERHOOD ELECTRICAL CENTER)
LOGIC
AIR MIX MOTOR (ATTACHED TO LEFT SIDE OF PLENUM)
A/C CYCLING SWITCH (RIGHT REAR OF ENGINE COMPARTMENT, ON ACCUMULATOR)
A/C COMPRESSOR CLUTCH DIODE
A/C COMPRESSOR CLUTCH
G112 (FRONT OF LEFT CYLINDER HEAD)
HOT AT ALL TIMES
HOT IN RUN
HOT AT ALL TIMES
MAXI FUSE 12 40A
SEC FAN FUSE 10A
MAXI FUSE 13 40A
UNDERHOOD ELECTRICAL CENTER
PRIMARY ENGINE COOLANT FAN RELAY (BASE AND V03) (UNDERHOOD ELECTRICAL CENTER)
SECONDARY ENGINE COOLANT FAN RELAY (UNDERHOOD ELECTRICAL CENTER)
POWERTRAIN CONTROL MODULE (BEHIND RIGHT SIDE OF I/P)
RELAY CTRL
A/C REQUEST
A/C ON SIGNAL
PRESS SW INPUT
RELAY CTRL
IDLE SPEED CONTROL POWER STEERING PRESSURE SWITCH (NEAR POWER STEERING UNIT)
PRIMARY COOLANT FAN MOTOR (BASE AND V03)
SECONDARY COOLANT FAN MOTOR
G112 (FRONT OF LEFT CYLINDER HEAD)
G109 (BEHIND RIGHT HEADLAMP ATTACHED TO RADIATOR SUPPORT)
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Fig. 6: Automatic A/C-Heater System Wiring Diagram